ice of the Arctic. Experimental new drifting station "North pole" was temporarily opened in 2001.

More than a dozen of international expeditions are currently working in the Arctic with Russia's participation.

Interest in participating in the active development of the Arctic zone is showing more and more States. This is due to global climate change, opening new opportunities to establish regular shipping in the Arctic Ocean, as well as greater access to natural resources in this vast region.

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RESEARCH METHODS OF SPACE OBJECTS AND THE CONTRIBUTION OF TOMSK SCIENTISTS INTO THE DEVELOPMENT OF TECHNOLOGY

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Arctic geosynclinal mobile belt of the Earth's crust, framing the vug of the Arctic Ocean, is a poorly studied object of the Earth. According to Victor Efimovich Hann, a scientist and structure geologist, there was a Hyperborean continental platform during the Pre-Mesozoic period, which constitutes the base of the Arctic Ocean at present. This Hyperborean segment, in the estimation of scientists, occurred in the North of Novosibirsk Islands, Wrangel Island, Alaska, Canadian Arctic Islands and in the east of the submarine Lomonosov's ridge. This speculation at the present time has a lot of followers, as Arctic has been researched in last decades using actual space methods of survey (fig.1).

Mother space vehicles are technical means, which are placed in orbit with special transport rockets for researching the interplanetary environment and planets of the solar system in automatic mode. In terms of solving problems and engineer aspects these vehicles are divided into the following types: artificial Earth satellites, interplanetary stations, inhabited spacecrafts, long-term orbital stations.

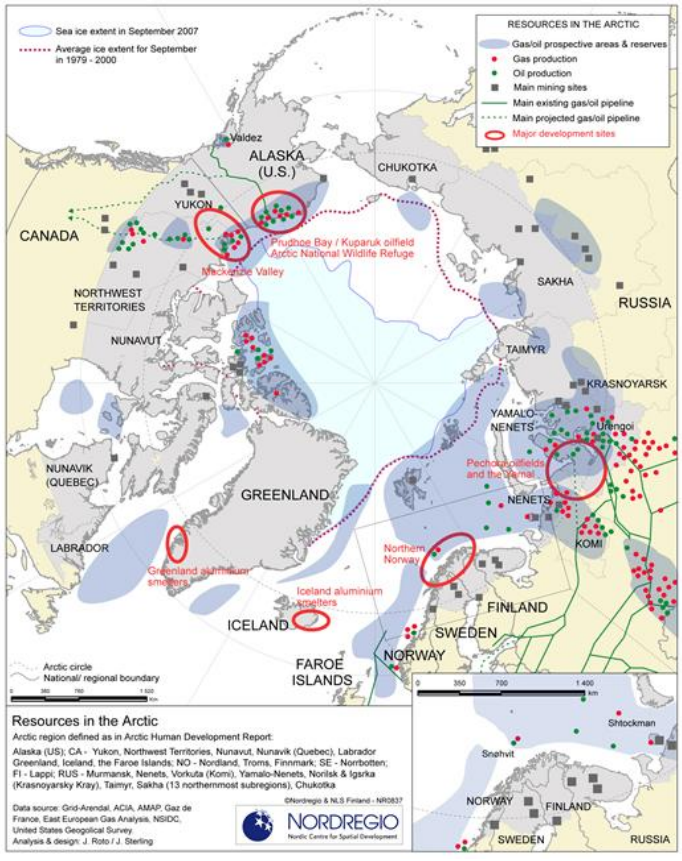

Fig.1 «Overview of the Arctic»

Visual observations differ in efficiency and can be used for divergent goals. First of all, they promote conscious selection of geologic exploration target, secondly they allow to estimate the speed and dynamics of geologic processes, and thirdly, they help to uncover never-before-seen geologic objects or events.

The photo survey of land surface from the altitudes of 150-200 km is termed as space survey. Space survey can be realized using inhabited space crafts, orbital stations, and automatic artificial Earth satellites, hand-held cameras, photograph machines and semi-photograph machines. The scale of survey depends on two most important values: the height of survey and focal distance of objective lens. Space cameras allow to get plan and perspective images of earth surface depending on inclination of optical axis. At the present time scientists use photographic equipment with high resolution, allowing to get space survey with the covering up to 60% or more.

Radio-locating survey is the most important type of remote measurements. It is used when the observation of planets is difficult due to natural conditions: fog, clouds and etc. It can be carried out at night. RL survey is realized in the range of E-M spectrum. During the survey the RF signal is sent to the target object, reflected normally and fixed on the receiver installed on board. The RF signal is produced with special generator. The realized time of signal depends on the object distance.

Infra-red survey is based upon detection of thermal anomaly via recording thermal emission of Earth’s objects preconditioned by endogenous heat or solar radiation. IR survey is widely used in geology. Temperature non-uniformities of the earth's surface appear when different areas receive uneven amount of heat. Solar (external) and endogenous (internal) heat warms geological objects differently depending on the lithological rock properties, thermal energy, the light reflecting power and many other reasons.

Magnetic survey from space has been carried out since 1958. The data are automatically sent to the Earth and processed via ECM. This processing results in worldwide earth’s magnetic field profiles or maps. The source of magnetic anomaly, detected with artificial satellites, is located somewhere in between the Earth’s core and the mantle. Magnetometers installed on interplanetary stations, allow researchers to study geomagnetic fields of planets in the solar system. The data obtained from magnetic survey from space are of great interest for comparing geology of planets.

Laser survey is based on monochromatic radiation with fixed wavelength. The constancy of laser wavelength allows to ascertain the orbit parameters of Earth and other planets and record the movements of separate blocks in the Earth's crust.

Lidar spectrometry, used for geological purposes, is one of the active surveys, based on an impulse radiation source. Lidar spectrometry is a geochemical survey of near-surface atmosphere layers used for detection of microelements or their compounds, concentrated over present geological objects. The essence of the method is in active probing of near-surface layers of the atmosphere and recording the results of remote spectral analysis.

The graduates of Tomsk Polytechnic University made a significant contribution in the development of methods and devices for exploration of space objects and Earth. There are leading specialists of Space industry enterprises among them. Their names are closely associated with the history of space exploration.

V. V. Khartov a doctor of technical sciences graduated from TPU in 1978 with honors. He started his career as an engineer and was promoted to the position of Deputy chief designer of electric system projects and spacecraft control at astronomical observatory "Information satellite systems" named after academician M. F. Reshetnev.

In 1970 an interplanetary station "Luna -16" delivered the samples of lunar soil taken from the surface of the moon with the space drill designed by O. D. Alimov first time in Soviet Union.

On the 12th of September the carrier rocket "Proton-K / D" was launched which brought “Luna-16” on the flight path to the moon.

On September the 13th, 1970, the correction of the flight path took place to make the station get to the targeted point of circumlunar space.

On September the 17th, 1970, the station "Luna-16" got into the moon orbit. September 20, 1970, the station "Luna-16" made a soft landing on the lunar surface near The Fertility Sea. The deviation from the target point was 1.5 km. The mass of the station was 1880 kg. 21 Sep 1970, the return device of the automatic interplanetary station "Luna-16" took off the moon surface. The mass of this stage was 512 kg. The lunar soil in a special capsule was placed on board this vehicle. On the 24 of September in 1970 the returning vehicle weighing 35 kg made a soft landing 80 kilometers South-East of the town Dzhezkazgan in USSR.

The satellite “Tomsk-TPU-120” is the first Russian space device made using 3D-technologies and unique materials. This satellite is referred to as a “nanosatellite” with the sizes 30x11x11 centimeters. This device was made in scientific educational center “Modern Production Technology” at TPU in cooperation with the Rocket-and-space corporation “Energy” and Institute of Material Engineering Physics at Russian Science Academy subdivision. The satellite was sent to International Space station in 31 of March on board transport and cargo-carrying spaceship “Progress MC-02” from Baikonur spaceport.

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PROSPECTS ASSESSMENT OF UNDERGROUND RESERVOIRS USE AT DEVELOPMENT OF OIL AND GAS FIELDS ON THE RUSSIAN ARCTIC SHELF

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Development of hydrocarbonic fields of the Arctic seas requires the solution of a number of complex technological problems connected with special climatic conditions of the region and ice situation on the considered sea water area. One of such problems is